Digital Indicating PID Temperature/ Process Controllers TP-Series

IMO

Dual Display 4 digit PID Process/ Temperature Controllers with Auto-tuning.

- Multi –Input selectable
- 1 alarm standard & 2nd optional alarm
- Optional Heat/Cool outputs
- PID with Auto-tune, PD or on/off modes
- 2 Set point selection option
- RS485 Communication option with IMO/Modbus
- Heater Burnout alarm option
- IP66 protection
- Conforms to UL/CSA & CE

Options and ordering codes

TP40A - **R** / **M** **A2** **240AC**

Multi-sensor Input

48 x 48 mm dual display with 1 alarm	**TP40A**
96 x 48 mm dual display with 1 alarm	**TP80A**
96 x 96mm dual display with 1 alarm	**TP90A**

Relay output	**R**
Signal Voltage for SSR	**S**
Analogue Current 4-20mA	**A**
Analogue Voltage 0 – 10V	**V**

240AC	100-240VAC supply
24VAC	24VAC/DC supply

A2	With second alarm
W(5A)	Heater burnout Alarm 5A rated
W(10A)	Heater burnout alarm 10A rated
DR	Cooling output relay
DS	Cooling output signal voltage
DA	Cooling output current 4 – 20mA
DT	Cooling output SSR
C5	RS485 serial communications
SM	SP1/SP2 external selection
LA	Loop break alarm

Input ranges

Input type		Scale	
Thermocouple	K	-200 to 1370°C	-320 to 2500°F
		-199.9 to 400.0°C	-199.9 to 750.0°F
	J	-200 to 1000°C	-320 to 1800°F
	R	0 to 1760°C	0 to 3200°F
	S	0 to 1760°C	0 to 3200°F
	B	0 to 1820°C	0 to 3300°F
	E	-200 to 800°C	-320 to 1500°F
	T	-199.9 to 400.0°C	-199.9 to 750.0°F
	N	-200 to 1300°C	-320 to 2300°F
	PL-Ⅱ	0 to 1390°C	0 to 2500°F
	C (W/Re5-26)	0 to 2315°C	0 to 4200°F
RTD	Pt100	-200 to 850°C	-300 to 1500°F
		-199.9 to 850.0°C	-199.9 to 999.9°F
	JPt100	-200 to 500°C	-300 to 900°F
		-199.9 to 500.0°C	-199.9 to 900.0°F
DC	4 to 20mA DC	-1999 to 9999□-199.9 to 999.9 -19.99 to 99.99□-1.999 to 9.999	
	0 to 20mA DC		
DC	0 to 1V DC		
	0 to 10V DC		
	1 to 5V DC		
	0 to 5V DC		

- As for DC input, scaling and decimal point place change are possible.
- As for DC current input, shunt resistor 50 is needed as an external device.

Ordering combinations

When ordering, select the alphanumeric characters from the table above. When adding option, enter the code using a space ( ).

- For DC current output type, [Option: W] cannot be added.
- [Option: SM] can be added only to the TP40A
  [Option: SM] is provided as standard for the TP80A and TP90A.
- For Cooling control output , only [Option: DT] can be added to the TP40A.
- When [Option: C5] is added to the TP80A and TP90A , SV1/SV2 external selection cannot be used.

Possible combinations of options for TP40A:

TP40A	A2	W	DT	C5	SM	LA
Combination 1	0	0	-	0	0	0
Combination 2	-	-	0	0	0	-

Possible combinations of options for TP80A and TP90A:

TP40A & TP90A	A2	W	D_	C5	LA
Combination 1	0	0	-	0	0
Combination 2	0	-	0	0	0
Combination 3	-	0	0	0	-
Combination 4	0	-	-	0	0

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Specification

Display: TP40A
PV [Red 4 digits, Character size: 10.2 x 4.9mm (H x W)],
SV [Green 4 digits, Character size: 8.8 x 4.9mm (H x W)]

Display: TP80A
PV [Red 4 digits, Character size: 11.2 x 5.4mm (H x W)],
SV [Green 4 digits, Character size: 11.2 x 5.4mm (H x W)]

Display: TP90A
PV [Red 4 digits, Character size: 18 x 8mm (H x W)],
SV [Green 4 digits, Character size: 12.6 x 6.6mm (H x W)]

Input: Thermocouple
External resistance: 100Ω or less (However, for B input: 40Ω or less)

Input: RTD
3-wire system (Allowable input wire resistance per wire: 10Ω or less)

Input: DC Current
Input impedance: 50Ω (Connect shunt resistor 50Ω between input terminals.)
Allowable input current: 50mA or less (When shunt resistor 50Ω is used)

Input: DC Voltage (0-1V)
Input impedance: 1MΩ or greater
Allowable input voltage: 5V or less
Allowable signal source resistance: 2kΩ or less

Input: DC Voltage (0-5V, 1-5V, 0-10V)
Input impedance: 100kΩ or greater
Allowable input voltage: 15V or less
Allowable signal source resistance: 100Ω or less

Accuracy: Thermocouple (Setting • Indicating)
Within ±0.2% of each input span ±1 digit or ±2°C (4°F) whichever is greater
However, R or S input 0 to 200°C (0 to 400°F): Within ±6°C(12°F), B input 0 to 300°C (0 to 600°F): Accuracy is not guaranteed. K, J, E, and N input less than 0°C (32°F): Within ±0.4% of each input span ±1 digit

Accuracy: RTD (Setting • Indicating)
Within ±0.1% of each input span ±1 digit or ±1°C (2°F) whichever is greater

Accuracy: DC Current & V (Setting • Indicating)
Within ±0.2% of each input span ±1 digit

Input sampling period 0.25 seconds

Output: Relay types
SPNO/NC: 3A 250V AC Resistive load, 1A Inductive load cosφ=0.4

Output: signal voltage types
12VDC +2VDC/-0VDC, Max. 40mA (Short-circuit protected)

Output: analogue current 4 to 20mA DC Load resistance: Max. 550Ω

Output: analogue voltage 0-10VDC – Output impedance 500Ω

Control action
User selectable: PID (with auto-tuning function), PI, PD (with manual reset function), P (with manual reset function), ON/OFF

Proportional band (P)
Thermocouple: 0 to 1000°C (0 to 2000°F)
RTD: 0.0 to 999.9°C (0.0 to 999.9°F)
DC current and DC voltage: 0.0 to 100.0%

Integral time (I) 0 to 1000 seconds

Derivative time (D) 0 to 300 seconds

Proportional cycle 1 to 120 seconds (Not available for DC current output type)

ARW 0 to 100%

Hysteresis
Thermocouple and RTD: 0.1 to 100.0°C (°F)
DC current and DC voltage: 1 to 1000

Alarms (A1) and (A2)
Relay SP 3A 250V AC (Resistive load), Electric life: 100,000 times

Alarms action
ON/OFF action, Hysteresis 0.1 to 100.0°C (°F) (1 to 1000 analogues)

Alarm Functions Alarm Function and NO/NC can be selected by key operation.

- **No alarm**
- **High limit alarm** (Deviation setting)
  Setting range: -(Input span) to Input span
- **Low limit alarm** (Deviation setting)
  Setting range: -(Input span) to Input span
- **High/Low limits alarm** (Deviation setting)
  Setting range: 0 to Input span
- **High/Low limit range alarm** (Deviation setting)
  Setting range: 0 to Input span
- **Process high alarm**
  Setting range: Input range low limit value to Input range high limit value
- **Process low alarm**
  Setting range: Input range low limit value to Input range high limit value
- **High limit alarm w/standby** (Deviation setting)
  Setting range: -(Input span) to Input span
- **Low limit alarm w/standby** (Deviation setting)
  Setting range: -(Input span) to Input span
- **High/Low limits alarm w/standby** (Deviation setting)
  Setting range: 0 to Input span

When input is with decimal point, the negative low limit value is –199.9 and the positive high limit value is 999.9

When input is DC current or DC voltage, input span is scaling span.

When input is DC current or DC voltage, input range low limit value is scaling low limit value and input range high limit value is scaling high limit value.

Supply voltage
85 to 264VAC 50/60Hz (100 to 240VAC +10% -15%), 20 to 28VDC/AC 50/60Hz

Power consumption Approx. 8VA

Insulation resistance >10MΩ at 500VDC

Dielectric strength
1.5kV AC for 1min between input terminal and ground terminal, between input terminal and power terminal, between power terminal and ground terminal, between output terminal and ground terminal, between output terminal and power terminal

Ambient temperature 0 to 50°C

Ambient humidity 35 to 85%RH (No condensation)

Mounting
Flush - Screw type mounting bracket
(Mountable panel thickness: Within 1 to 15mm)

Front Panel IP66

Weight TP40A (Approx. 200g), TP80A (Approx. 250g), TP90A (Approx. 370g)

Case material Light grey flame resisting resin

Standard functions
Sensor correction, Setting value LOCK, Power failure countermeasure, Self diagnosis, Automatic cold junction temperature compensation (Only thermocouple), Sensor burnout alarm, Input burnout, Warm-up display, Auto/Manual control selection

Optional features

Alarm 2 [A2]

When this option is added, 1 alarm point is added.

Alarm action type, Setting range and Relay contact type are the same as those of Alarm 1 (A1).

Heater burnout alarm [W]

This function watches the heater current with a CT (current transformer), and detects the burnout.

Heater rated current must be selected from 5A, 10A, 20A and 50A.

Heat/cool outputs with air/oil/water cooling compensation [DR, DS, DA, DT]

Heat and cool outputs are used to give more accurate control than a heat output alone.

There are 4 types of control output i.e. Relay contact output (DR), Non-contact voltage output (DS), DC current output (DA) and Non-contact relay output (DT). The type must be designated when ordering. (TP40A only has DT option)

Output type specifications as in specification table except:
SSR (DT): 3A 250VAC (Resistive load)

Cooling action mode (This must be selected by key operation from below.)

- Air cooling (Linear characteristic)
- Oil cooling (1.5th Power of characteristic)
- Water cooling (2nd Power of characteristic)

Serial communication [C5]

Various setting status changing, reading and setting of the TP Series can be performed from external computer, HMI or PLC.

Communication interface Based on EIA, RS-485
Communication method Half-duplex communication start-stop synchronous
Data transfer rate (2400/4800/9600/19200bps) Select by key operation
Parity (Even/ Odd/ No parity) Selectable by key operation
Stop bit (1 or 2) Selectable by key operation
Communication protocol Based on IMO standard protocol or Modbus (Selectable by key operation) When Modbus is selected, RTU mode or ASCII mode can be selected by key operation.
Number of connectable units A maximum of 31 units per communication port
Communication error detection Parity check and Checksum

Set point 1/ Set point 2 external selection [SM]

Set Point 1 & Set point 2 can be changed by external contact

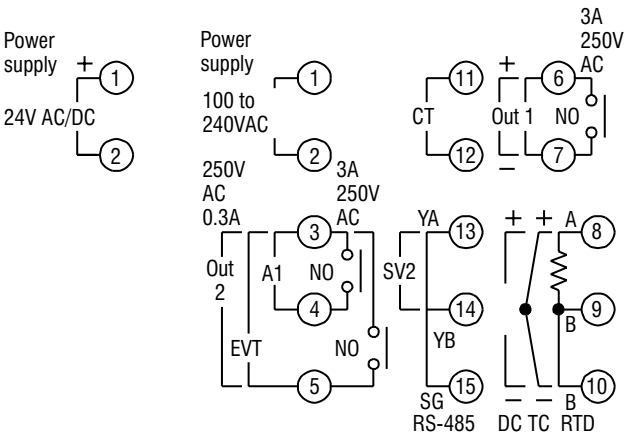
Terminal between 13 and 14 is open: SV1, Terminal between 13 and 14 is closed: SV2

Loop break alarm [LA]

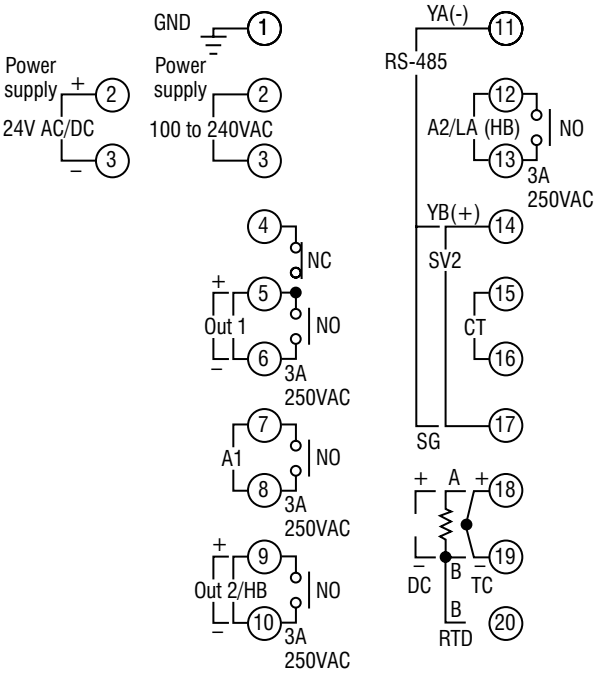
This option enables Heater burnout, Sensor burnout and Input burnout to be detected.

Wiring connections

TP40A



TP80A and TP90A



Key	
Out 1	Main Output terminals
A1	Alarm 1 terminals
Out 2/HB	Cooling output or Heater burnout terminals
RS485	Communication terminals
A2/LA(HB)	Alarm 2, Loop break alarm or Heater burnout alarm output terminal
SV2	Set point 2 selection terminal
CT	Current Transformer
TC	Thermocouple input
RTD	RTD input terminal
DC	DC Current/voltage input
EVT	Event input

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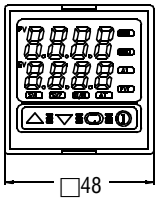
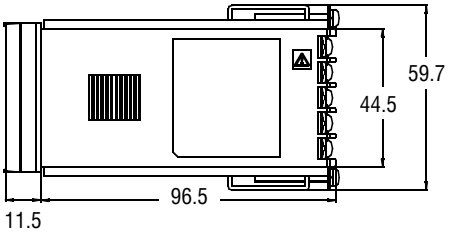
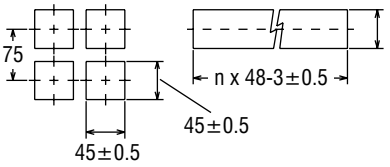
Dimensions and mounting mm

TP40A external dimensions

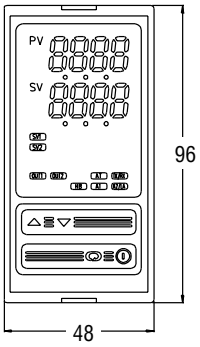


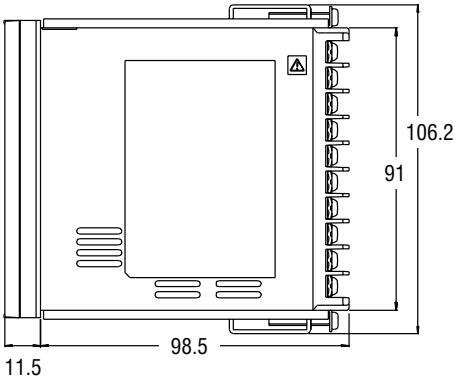


Panel cut out (lateral close mounting)



TP80A external dimensions





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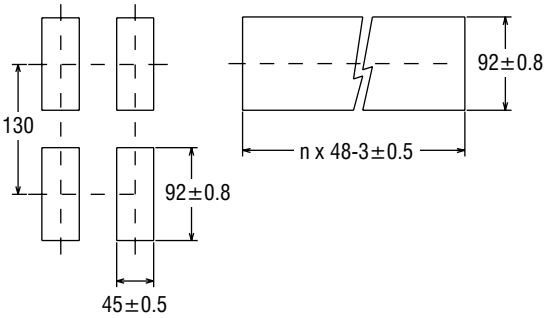
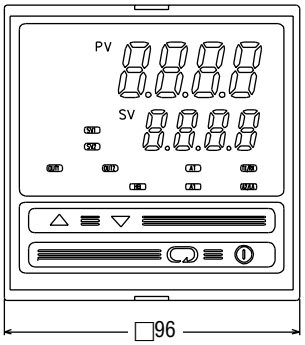
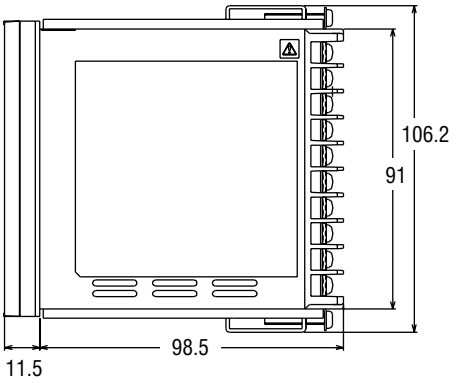
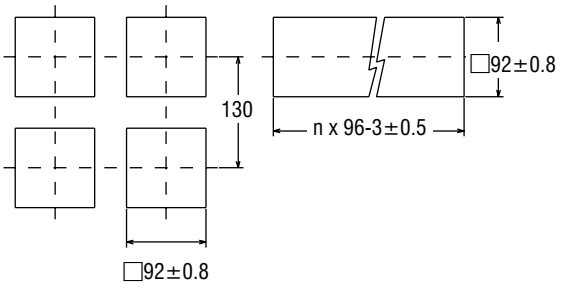


TP90A external dimensions





Panel cut out (lateral close mounting)



n = number of units mounted